CLAIMS

1. A rotary assembly comprising a rotatable shaft; a sleeve journalled on the shaft and adapted to be stationary during rotation of the shaft; an earth vector sensor mounted for rotation with the shaft, the earth vector sensor being responsive to a given physical parameter in a direction substantially radial to the shaft; and an orientation signal generator which comprises means for generating a pulse train representing rotation of the shaft relative to the sleeve as a predetermined number of pulses per revolution, and means for deriving from the pulse train and the output of the earth vector sensor the angle between the earth vector and a given position on the sleeve.

2. A downhole assembly adapted to form part of a drill string and comprising a rotary assembly according to claim 1, and in which the earth vector is the component transverse to the drill string axis in the vicinity of the assembly of the earth's local magnetic field or gravitational field.

3. An assembly according to claim 1 or claim 2, in which the means for generating a pulse train comprises a directional sensor arranged radially of the shaft and cooperating with a plurality of elements equispaced around the circumference of the sleeve.

4. An assembly according to claim 3, in which said elements are ferromagnetic segments, and the sensor is a coil.

5. An assembly according to claim 4, in which the ferromagnetic elements are 24 in number.

6. An assembly according to claim 3, in which said deriving means operates to integrate the earth vector sensor output over each of a number of successive part-revolutions of the shaft to provide a series of simultaneous equations, and to solve these equations to provide an orientation angle for each of said plurality of elements with respect to the earth vector.

7. An assembly according to claim 6, in which said part-revolutions are quarter revolutions.

8. An assembly according to claim 6, in which said simultaneous equations are as defined in equations (vi) to (ix) above.

9. A downhole assembly according to claim 2, in which the sleeve forms part of a gamma ray detector, the sleeve being apertured to permit detection of gamma radiation strength transverse to the drill string axis.

10. A method of sensing the angular position of a rotary assembly which comprises a rotatable shaft and a sleeve journalled on the shaft and adapted to

be stationary during rotation of the shaft; the method comprising sensing an earth vector along an axis transverse to and rotating with the shaft, generating a pulse train representing rotation of the shaft relative to the sleeve as a predetermined number of pulses per revolution, and deriving from the pulse train and the earth vector the angle between the earth vector and a given position on the sleeve.